



## Advanced Surface Ship Watertight Enclosure

A new watertight interior door being evaluated for the Navy supercarrier *USS Gerald R. Ford* (CVN-78) incorporates advances in materials, design, and manufacturing processes. The new doors are 27% lighter than the existing Navy standard watertight doors (NSWDs). The cellular sandwich panels in the new doors are made from corrosion-resistant steel using highly accurate, high-speed, automated laser cutting and welding processes. Novel technologies were used to produce the door seals and latching mechanism, and the plug-in-hole installation process reduces distortion.

NSWDs, designed in the early 1950s, are expensive to install and maintain and are too heavy for today's needs. Installation costs are about \$7,500 per door, and watertight doors require frequent maintenance because of poor functioning, corrosion, and loss of water-tightness.

The new doors have the needed stability, but their reduced weight allows more weight to be allocated to armor, ordinance, cargo, and other warfighting-related functions. Low distortion plug-in-hole installation reduces the installation and maintenance costs. The use of a more corrosion-resistant steel, combined with reasonable manufacturing costs, will reduce the total ownership costs, making these resources available for other uses.



The new door was designed at Penn State's Applied Research Laboratory, and private companies have built prototypes. The prototype doors are undergoing hydrostatic, shock and cyclic testing. Northrop Grumman Newport News (NGNN) will document installation costs and investigate ways of reducing those costs. Manufacturing specifications for an optimized design will be submitted to the Navy for potential acquisition at the end of the project.

On this project, ARL Penn State's Institute for Manufacturing and Sustainment Technologies (iMAST) is teamed with the Naval Surface Warfare Center, Carderock Division, for Navy in-service experience and their expertise in functional and performance requirements of watertight doors, and with NGNN for their expertise in door installation and shipbuilder requirements.

### Specifications:

New Door Weight	213 pounds	Pressure capacity	15 psi
Existing NSWD Weight	292 pounds	Overload	1.5
Dimensions	26 inches x 66 inches	New Door Material	304 stainless steel
Latches	8 latching dogs	NSWD Material	A-36 low carbon steel
Window	6 inch diameter		

